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AND

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Devoted to the Interests of Illumination, Heating, Ventilation and Sanitary Improvement, Domestic Economy, and General Science.

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NEW YORK, SATURDAY, JANUARY 2, 1869.

$3 PER ANNUM
IN ADVANCE.

Shackelton's System of Heating by Exhaust Steam.

Warming buildings by and heating water and boiling for Dyers, Soap Boilers, and for cooking, etc., by the use of live steam has long been in practice, and is an improvement on many accounts, although expensive and troublesome, on account of the necessity of keeping the fires and boilers in working order, to do which requires the services of an engineer nearly as much as it does to run a steam engine.

Shackelton's system of heating is intended to utilize the waste or exhaust steam in factories and all buildings where steam power is employed. This is effected by the use of a peculiar automatic valve applied to the exhaust pipe, which prevents the back pressure and consequent loss of power, which inevitably occurs without it.

The automatic valve in connection with a peculiar system of adjustment of the heating pipes, obtains the full heating effect of the steam at a minimum of cost; while the steam is condensed, and 95 per cent. of the water is economized and returned to the boiler at a high temperature in a perfectly pure state for re-use, thereby showing a material saving in fuel. It also keeps up a supply of chemically pure water to the boiler, which prevents incrustation or oxydization.

This system will heat over 15,000 cubic feet of room space, it is said, and save over six gallons of pure hot water per hour without deposit, per horse-power. All this may be done entirely without any cost, after the first outlay for the apparatus, which is simple, safe, and economical.

We consider this system the most important improvement for utilizing waste heat that has yet come under our observation, and it works as well in practice as in theory.

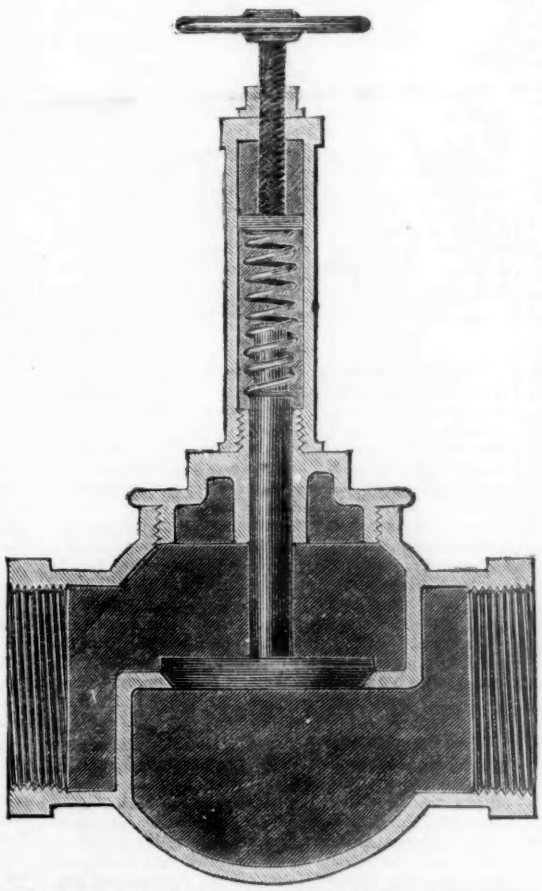
The inventor and patentee, we understand, is overrun with orders to apply his system of heating, and we have seen numerous testimonials from those who are using it in their mills, factories, etc., speaking of it in the highest terms. It has an advantage in practice of from 25 to 50 per cent. saving in fuel over the common method of using exhaust steam, besides its greater simplicity.

The engraving herewith will be readily understood by the intelligent reader. It gives a sectional view of the automatic valve which is applied to the exhaust pipe above the connections of the heating pipes. The spiral spring shown, holds the valve in its seat and is adjusted by the set-screw to regulate to any pressure required.

For further particulars, apply or address the inventor, Joseph Shackelton, 22 Pine street, Room 10, or 45 Courtlandt street, New York.

Liquid Fuel.

The trial of Messrs. Dorsett & Blythe's system of burning liquid fuel took place on Monday, October 12, on board the "Retriever," a screw steamer of 500 tons burden, and 90-horse power. There were on board Capt. Selwyn, R. N., Mr. Steel, from the Admiralty, Capt. Crohm, of the Russian Navy, Dr. Paul, Mr. Silverlock, of the Citizen Steamboat Company, Mr. Parker, Mr. Nursey, Mr. Crowe, Mr. Murray, Mr. Stewart, Mr. Herron, Mr. Lamerton, of Woolwich Arsenal, and many other gentlemen interested in the subject of liquid fuel. The vessel left the wharf of the Patent Fuel Company's works, at Deptford. During the whole trip the oil burning arrangements worked exceedingly well, except on two or three occasions, when much smoke was given off from the funnel for a minute or two, owing to some slight derangement of the supply to the furnace; but this cannot be regarded as arising from anything else than the crude and experimental nature of all the arrangements which had been hastily adapted to a vessel intended to burn coal. Altogether the result of the trial gave great promise of success being attained in solving the problem of burning oil efficiently in a marine boiler furnace.



SHACKELTON'S AUTOMATIC BACK PRESSURE VALVE.

One very important feature of this system consists in making the oil to be burnt do the work of supplying the fuel to the boiler furnace, instead of using steam for this purpose. For this object the oil is first heated in a generator, which is, in fact, a small boiler, similar to those of contractors' engines, and the oil vapor thus produced is led by a pipe into the furnace of this boiler, where it is kept burning sufficiently to maintain the production of oil vapor at a convenient pressure. Another pipe passing from this generating boiler leads the oil vapor to the steam-boiler furnace, where it issues in jets, and is burnt by proper regulation of the air supply without any smoke. This arrangement presents great advantages over the various plans of converting the oil into actual gas before burning it, all of which involve the probability of the supply pipes becoming choked by pitch and charred products. It has also an advantage over the plan adopted by Messrs. Field, Wise, and Aydon, and by others, of effecting the supply of oil to the furnace by means of a steam-jet, inasmuch as it does away with the waste of heat expended in producing the steam applied for that purpose. Moreover, the extreme simplicity of the contrivance is itself a recommendation in its favor as compared with other plans of burning oil. The material employed in this trial was the dead oil, or creosote of the gas tar refiner, and the consumption on board the "Retriever" was at the rate of about 35 gallons per hour. The consumption of coal on board this vessel was stated to have been about 8 cwt. per hour, which gives the practical effect of the oil as about 2½ times that of coal, and shows that there was perfect combustion of the fuel, and a full application of its capabilities.—*London Mining Journal, Oct.* 17.

—A new alkaloid has been discovered by Hesse, to which he gives the name "Rhœadine." It exists in opium and in the red poppy. It is soluble in alcohol, ether and water, crystallizing from the ether in white prisms. Bichloride of mercury gives a white amorphous precipitate, ammonia precipitates it in white crystalline flocculi, chloride of gold gives a yellow precipitate, and it is decomposed into gold by strong acids, giving a purple solution.

Chemical Repertory.--No. 5.

JANUARY 2, 1869.

CHEMICAL *EXCERPTA.*

Under this head I purpose to gather in the most *condensed* form practicable, from such recent scientific journals, both at home and abroad, as come under my eyes; the substance of such articles as seem deserving thereof. In this work, I shall not, as might be thought, hold myself confined to novel facts alone; regarding new hypotheses, and even speculations, when involving labor and ingenuity in the *generalization* of facts, as even more valuable to Science. It is hardly necessary to add that in my own comments, to which a degree of personal responsibility attaches, a less condensed style than in the abstracts themselves will be inevitable.

HENRY WURTZ.

[*Bulletin de la Société Chimique—Sept. and Oct.* 1868.]

(Page 192.) ROSENSTIEHL has found that besides the ordinary crystallizable *toluidine*, there also occurs in association with the aniline of commerce another *liquid* alkaloid, isomeric with toluidine, which he calls *pseudotoluidine*. Since 1863 HOFFMAN has taught us that aniline alone will not produce the brilliant tinted salts of rosaniline, but that toluidine must be present also. R. finds that neither species of toluidine alone will act in this way, but that a mixture of both of them behaves with arsenic acid like a mixture of the ordinary crystallized toluidine with aniline, affording the arseniate of rosaniline; but, what is most remarkable, affording it in very much larger proportion. In fact, whilst a mixture of pure crystallizable toluidine with aniline yielded but 22.5 per cent. of crystallized red color, the mixture of the two toluidines, as obtained from coal-tar, yielded 39 to 40 per cent. In the former case about 20 per cent. of aniline remained unchanged, so that the proportions of the toluidine and aniline entering into the reaction were 2 parts of the former to 1 of the latter. Commercial aniline, of course a mixture, yields from 27 to 30 per cent. of the color. The history of the subject, since HOFFMAN's observations in 1863, is interesting. COUPIER first succeeded in separating benzole and toluole by fractional distillation. The fact was thus developed that the toluole of coal-tar, presenting all the characters of a peculiar and unique body, never furnished toluidine of a homogeneous nature, but a liquid which could never be totally crystallized, although its boiling-point was constant at 198° C., and its elementary composition that of toluidine. GRAEFINGHOFF (*Jour. für prakt Chemie*, 95, 221), put forth a hypothesis of the existence of two modifications, a solid and a liquid toluidine. *Nitrotoluole* exhibits similar anomalies. JAWORSKY discovered crystallized nitrotoluole, and ALEXEYEFF showed that this produces a toluidine totoally crystallizable. KEKULE believed that crystallized nitrotoluole was the only pure form, and that the liquid was the same compound, contaminated with some foreign substance that prevented crystallization. There are certain coals, among them Scotch coals, whose tar contains a toluole furnishing a completely crystallizable nitrotoluole. ROSENSTIEHL now finds, as stated, that most coal-tar toluole is a mixture of two isomeres.

The author's statements regarding the reactions of these alkaloids, now first determined by him upon the pure substances, are of high interest and importance. If, as is well known, aniline is mixed with sulphuric acid, and any of the following reagents added, aniline-blue is formed: *salts of* CrO^3, Mn^2O *and* ClO; Cl; MnO^2 *and* PbO^2; O *from a + Voltaic pole;* aqua-regia. This, however, he finds to be not distinctive of aniline, pseudotoluidine giving the same colorations, while pure toluidine gives no color at all, or but a yellowish one. If nitric acid be used with the sulphuric, he finds on the contrary that aniline and pseudotoluidine give no color, but that toluidine does; thus enabling us to detect the latter in the presence of the other two. The material is dissolved in *bihydrated sulphuric acid*, HO,SO^3+HO, then a drop of nitric acid, on a glass rod, quickly introduced into the midst of the liquid and the tube agitated. In a second, the liquid will be filled with very beautiful blue veins, which increase in intensity and color till the whole becomes deep blue, which in a minute passes into violet, and in some hours into deep brown. The least excess of water injures the delicacy of the test. If but little aniline or pseudotoluidine be present, the color produced is blood red, this last being BRAUN's delicate reaction for nitrates, in which commercial aniline was used. As the chlorates give but a slight orange color under these conditions, this test serves to detect small quantities of NO^5 in the presence of ClO_5. This is more sensitive and certain than any of the laboratory tests for NO^5. The presence of chlorides in quantity, which destroys the ferrous sulphate test, is harmless here. For many other most interesting things contained in this important memoir of ROSENSTIEHL, I must refer thereto.

ROSENSTIEHL finds by his methods of testing that the commercial anilines contain notable proportions of pseudotoluidine, besides true toluidine. The commercial toluidine of COUPIER also contains 36 per cent. of pseudotoluidine and but 62 per cent. of real toluidine. By the action of arsenic acid, red colors are produced as follows:

From mixtures of 2 pts. pseudotoluidine and 1 pt. aniline, 50 prts
" " 1 part " " 2 " toluidine, 25 "
" " " aniline " 2 " " 39 "

Determination of the boiling-point is not sufficient to fix the tinctorial value of an aniline. REIMANN's method, founded upon conversion of a commercial aniline into oxalate and then dissolving out oxalate of aniline with ether, leaving toluidine undissolved, is also worthless, REIMANN's aniline thus separated being neither more nor less than pseudotoluidine. From COUPIER's aniline, the 5 per cent. of the other two bases therein contained may be separated, so as to furnish pure aniline, by first transforming into oxalates, and exhausting with ether, which takes out the pseudotoluidine; then converting the residue into chlorohydrates, which are then separated by recrystallization, the chlorohydrate of aniline being some six times more soluble than that of toluidine, 100 parts of cold water dissolving about 129.5 of the former and but 23 of the latter. The comparison with ROSENSTIEHL's new and exhaustive researches, of HOFFMANN's recent announcement (of what would now seem to have been views largely imbued with hypothesis) of the existence of two bases, *rosaniline* and *leucaniline*, the one giving colored, the other colorless salts; must be deferred for the present. H. W.

(Page 237.) M. F. MUCK states that crystallized cubes of *galena* are obtained by the action of HS on hot solutions, strongly acid, of *nitrate of lead*, the hotter and more acid the better. Even solutions nearly neutral, if partially precipitated, so as to render them acid, afterwards yield crystals. Precipitates from the acetate and chloride of lead are wholly amorphous. BECQUEREL, DE SENARMONT, BISCHOF, BRUSH, of Yale College, and others, have already obtained galena in the wet way. It is stated that FLACH, by placing a stick of brimstone in an alkaline solution of oxide of lead, obtained, after some years' deposits, both on the stick itself and on the walls of the vessel, covered with small cubical crystals of galena, recognizable without a magnifier. H. W.

(Page 250.) BASAROW has discovered that *anhydrous carbonate of ammonium* is converted into *urea* by heating in a sealed tube to 130° C. (266° F.) The carbonate he obtained by the action of CO^2 on NH^3 dissolved in absolute alcohol. He has observed that the same result, conversion into urea, follows to a notable degree, upon the subjection of commercial carbonate of ammonia to a temperature of 130–140° C.; whence he infers that this latter may contain the anhydrous carbonate of ammonium. The following equation will make clear the theory on which BASAROW based his investigation:

$$2(NH^4O, CO^2) = C^2H^4N^2O^2 + 4\,HO.$$

H. W.

(Page 331) Of the products obtained by the distillation of coals and bituminous schists, the most important one now is the *paraffine;* the liquid oils, since the introduction of cheap petroleum, being of minor value. The ordinary mode of obtaining refined paraffine from the crude distillates involves two redistillations of the same, which always detracts from the yield of paraffine, both in quantity and quality; a portion being converted into permanently liquid hydrocarbons, while another portion becomes modified so that the solid products are softer and more fusible. HUBNER proposes therefore to treat the crude tarry products directly with sulphuric acid, then, after decantation, to distil from a few hundredths of *quicklime* (instead of the soda ordinarily employed) and then to crystallize, press and purify in the usual way by washing with liquid hydrocarbons. He thus obtains a greater yield and a better product.

H. W.

[*November*, 1868.]

(Page 350.) In the first number of the REPERTORY was given the results of HLASIWETZ & HINTERBERGER, in examining the effects of incandescence on the vapor of oil of turpentine, $C^{20}H^{16}$. BERTHELOT has worked upon the same subject. He passed turpentine through a porcelain tube heated to a very moderate redness. *Styrolene*, or styrole, $C^{16}H^8$, which he first sought for, he did not find, with certainty, among the condensible products, and in the gases formed but 2 to 3 per cent. of ethylenic hydrocarbons condensible by bromine. The liquids which redistil from the crude products below 250° C., on treatment with sulphuric acid, furnish a mixture of hydrocarbons of the benzolic series, which he separated by three fractional distillations. He separated *benzole*, $C^{12}H^6$, in small quantity, but the principal product was *toluole*, $C^{14}H^8$, whose identity he verified by its transformation into benzoic acid by oxidation. *Xylole*, $C^{16}H^{10}$, occurred also in notable quantity, from which he obtained the terephthalic acid, $C^8H^6O^4$; also a little *cumole*, $C^{18}H^{12}$; and a very little *cymole*, $C^{20}H^{14}$. *Naphthaline*, $C^{20}H^8$, occurs in considerable quantity, as is always the case when the benzolic homologues are heated to redness. H. W.

[*London Mining Journal, Nov.* 28, 1868.]

(Page 847.) The subject of *Liquid Fuels* still occupies attention; and doubtless there are cases where they will have their advantages. A Report by Dr. B. F. PAUL is quoted, which I find in full in the London *Artizan* of Dec. 1st, 1868. It relates to experiments on a screw-steamer, the *Retriever*, according to some plan of one DORSETT, of "burning the vapor under pressure." Material was "dead oil," (heavy crude oils of coal-tar) weighing 10.5 lbs. per gallon. The actual result was 12.36 lbs. of water vaporized (from 60° Fahr.) per lb. The most interesting part of Dr. PAUL's Report is an approximate comparison of this practical result with calculations based on theoretical grounds. To accomplish this he calculates the amount of vaporization corresponding to each of the main constituents known to exist in the dead oil, and averages these. I have added the formulas of these constituents:

Phenol	$C^{12}H^6O^2$	10.50 lbs.
Cresol	$C^{14}H^8O^2$	11.16 "
Naphthaline	$C^{20}H^8$	13.27 "
Xylole	$C^{16}H^{10}$	14.24 "
Cumole	$C^{18}H^{12}$	14.41 "
Cymole	$C^{20}H^{14}$	14.55 "
Average		13.02 lbs.

This average is but 5.4 per cent. more than the actual experimental result, part of the difference moreover being due doubtless to the relatively greater proportion of the compounds which stand first in the above list; and Dr. PAUL believes that in perfected practice an evaporation of 13 of water for one of dead oil may be relied on. This is nearly double that practically obtained from coal, weight for weight; and as a ton of coal requires 43 cubic feet of storage space and a ton of the oil but 34 feet, the saving of space would be over 60 per cent.

[If the crude and offensive heavy oils of coal-tar are to be used to advantage in this way, why should we not contrive to use *the tar itself directly?*] In the *Mining Journal* it is further stated that the same plan of throwing the oily vapors into a fire-space, has also been applied with great advantage to the reheating furnaces used in certain manufactures of iron; much time being thus saved in the working, whilst the articles are heated with greater uniformity, and therefore with less liability of detriment to the material. The subject of liquid and vaporous fuel is one upon which I have much to say, in reserve. H. W.

THE DRINKING WATERS OF THE AMERICAN METROPOLIS.

[The importance of the subject impels us to give place now to further extracts from Prof. CHANDLER's important Report, already quoted elsewhere in this issue. On a nearly related topic, the water supply of Brooklyn, we have much to say, on a near occasion, which should rudely startle the people of that great and growing city from their apathetic complacency on the subject.—H. W.]

SCHOOL OF MINES, COLUMBIA COLLEGE,
NEW YORK, Jan'y 22, 1868.

ELISHA HARRIS, M. D.,
Metropolitan Board of Health.

DEAR SIR: The accompanying report exhibits the results of the weekly examinations of Croton water during the thirteen weeks from July 19 to October 10, 1867. The samples were collected on Wednesday or Thursday of each week at

The Reservoir in the Central Park,
The Reservoir on Fifth avenue and Forty-first street,
The Hydrant at the School of Mines, corner of Fourth avenue and Fiftieth street,

The examination was limited to the determination of

1. The total impurities.
2. The inorganic matter.
3. The organic and volatile matter.
4. The oxygen required to oxidize the organic matter.
5. The hardness, or the carbonate of lime, or its equivalent.

The quantity of oxygen required to oxidize the organic matter in the water, is considered the best measure of its injurious character, as the organic matter is injurious in proportion as it is ready to undergo decomposition. In Dr. Letheby's reports of analyses of London waters, made to the Metropolitan Association of Medical Officers of Health, this oxygen is supposed to represent eight times its weight of oxidizable organic matter, and is so reported. I think this estimate excessive, and as it is a mere assumption, prefer to report the oxygen directly.

The results of the analyses are tabulated in parts in 100,000, and in grains in one United States gallon of 231 cubic inches.

	In 100,000 parts.	In 1 U. S. gal.
Inorganic matter	6.72	3 90 grs.
Organic and volatile matter.	1.12	0.66 "
Total	7.84	4.56 "

At the same time there was great uniformity in quality, the extremes of total impurity during the season having been 3.99 and 4.98 grains per gallon.

Accompanying this report are tabular statements of the composition of waters used in several large cities in the United States and Europe, in which it will be seen that it is only in the Cochituate, of Boston, and the Schuylkill, of Philadelphia, that the water is found to be as little contaminated with impurities; and even in these cities the quantity of organic matter exceeds that contained in the Croton water.

Would that the same statements could be made with regard to the two or three hundred wells now used in the villages and cities of the Metropolitan District, most of which are heavily charged with organic matter, derived from infiltering sewage, and ready, under favorable conditions, to develop cholera and other fatal diseases.

The character of these well-waters is faintly indicated by the analyses which I reported on July 12th. I say faintly, because the grounds in the immediate neighborhood of those wells had been cleared of numerous sources of contamination by the orders of the Board of Health, and because the heavy rains which had prevailed for some time had cleaned the district and diluted the waters. Notwithstanding these circumstances the water of one of the wells showed:

	In 100,000 parts.		In 1 gallon.
Inorganic matter....	66.6	....	38.93 grains.
Organic "	7.8	....	4.55 "
Total	74.6	....	43.50 "

These wells should be very carefully looked after, that they may not be permitted to pass a certain maximum limit of foulness before they are closed, at least temporarily, for the protection of the families who are unfortunately obliged to make use of them.

[In this connection are quoted the remarkable results of an analysis made in 1854 by Dr. Henry Draper, of a well-water from the 22d Ward of this city; which was:—Organic matter and volatile salts 23.28 grains, and fixed salts 24.29 grains, per gallon. Dr. John W. Draper, in comment upon this result, says:—"The organic matter is reported to have been of the most fetid kind, suggesting the proximity of a sewer, privy, or some other putrid receptacle," and advises the immediate closing up of the well. "The people that use it are drinking so much liquid poison, and no wonder they have bowel complaints."]

At some future time I hope to lay before you the results of the more comprehensive examination which the water-supplies of the Metropolitan District imperatively demand.

These analyses were conducted according to the methods employed by Prof. W. A. Miller, Dr. A. W. Robinson, and Dr. E. Frankland, "Jour. of the London Chem. Soc." New Series, III., 117, 1865; IV., 239, '66.

I should mention that I have been materially aided in this examination by Dr. H. Endemann, my private assistant.

Very truly yours,

C. F. Chandler, Ph. D.

The elaborate tabular statements of analyses appended to the Report, are summed up in the course of the above quotations.—H. W.]

[*Poetry and Science.*—Few poets, even of the present day, recognize the man of Science as a kindred spirit. It is nevertheless true that no two human pursuits are more intimately related or will in the future be more thoroughly blended together. From the following item, which lately appeared in our public prints, it would appear that we are fairly justifiable in claiming Coleridge as one of those who, had he not been among the greatest of poets, might have ranked high as a scientist. The perception of the true mission and vocation of Science upon Earth which such a master-mind would naturally form, is here too clearly displayed to leave any doubt of the authenticity of the passage.—H. W.]

"A gentleman of New Orleans has in his possession an edition of the works of Edmund Burke of 1834, which was once the property of Samuel Taylor Coleridge, author of the Ancient Mariner and Christabel. On the fly-leaf of the first volume are the following lines in the autograph of the poet:

'Burke possessed, and has sedulously sharpened, that eye which sees all things, actions, and events, in relation to the laws that determine their existence and circumscribe their possibility. He referred habitually to *principles*. He was a scientific statesman, and, therefore, a seer. For every *principle* contains in itself the germs of a prophecy; and as the prophetic power is the essential privilege of science, so the fulfillment of its oracles supplies the outward, and to men in general, the *only* test of its claims to the title. S. T. Coleridge.'

Color-Blindness.—Dugald Stewart could not distinguish between red and green, and John Dalton did not know blue from crimson. In the solar spectrum, instead of red, orange, yellow, green, blue, indigo and violet, Dalton only saw three colors, yellow, blue, and violet. He could distinguish no difference between the scarlet gown of a cardinal and the foliage of the trees, and when one day he dropped a piece of red sealing wax in the grass, he had great difficulty in finding it again. Mr. Dalton's case has given rise to the term Daltonism, which is now generally applied to this kind of color-blindness.

Color-blindness is much more common than is generally supposed. Among forty boys in a school in Berlin, five were found to be deficient in the power of distinguishing colors. The defect is also more common among gray-eyed persons than among those who have blue or brown eyes, and it is found more frequently among men than women. Out of five hundred sufferers only four were women. Strange to say, a peculiar keenness of vision is not unusual among color-blind persons. A young girl who could only distinguish between black and white, and to whom the whole world presented only an infinite variety of shades of gray, could see to read in the twilight long after any one else. Goethe records an instance of two young men who, although their sight was unusually powerful, were quite unable to distinguish blue and its varieties. He gave to this deficiency the Greek name *akyanoblepsy*, or blue-blindness.—*Am. Exchange and Review.*

Aniline.—It requires as many as 2,000 tons of coal to produce a circular block of *rosaniline* twenty-four inches high by nine inches wide, but this is sufficient to dye three hundred miles of silk fabric. H. W.

American Copper.—A writer in the *New York Tribune* has recently given the following important information:

"Two great uses of copper have been wiped out almost entirely within the past few years, viz., brass and bronze for cannon, and sheathing for ships. Our late war demonstrated that steel and iron were better than bronze or copper, consequently we see the United States and most of the Governments of Europe, substituting the former for the latter.

"Three-fourths of the sea-going vessels which have been built within the past ten years have been made of iron or steel, which of course require no copper sheathing. The consequence is, that copper has fallen in price in all the markets of the world nearly 50 per cent.

"In the Lake Superior Copper Mines, some fifty millions of money have been invested within the past 25 years. Of this vast sum not over *one* per cent. has been paid for the mines as they lay in a state of nature. The *ninety-nine* per cent. has been paid for machinery, mining material, work animals, forage, food, and clothing (the money paid for labor is nearly all expended by the miners for food and raiment) for it must be recollected that the copper region of Lake Superior produces nothing but mineral, unless it be a few potatoes, and possibly two per cent. of what hay is required.

"The capitalists who have expended this vast sum of money have only their mines to represent it, while the people have had the benefit of it.

"For every dollar received for copper within that time, ninety-five cents have been paid for labor and supplies. New-York and New-England furnish powder, dry goods, groceries, clothing, and shoes; Pennsylvania furnishes iron, steel, nails, and hardware; while the Lake States supply breadstuffs, meat, and forage.

"Who, then, is to be benefitted by keeping these mines in operation—the owners of the mines, who get *five cents* out of every dollar received for the copper, or those who receive the ninety-five cents, as I have shown?"

The very reasonable and pertinent deduction is drawn, that the copper-producing interests of the country should receive legislative protection. H. W.

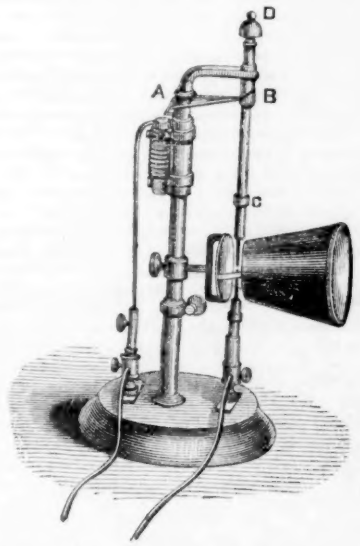
Defecation of Bisulphide of Carbon.—As supplementary to the observations of Millon, on this subject, presented in our last issue, I am permitted to state that Professor B. Silliman has found the most satisfactory agent to be, not CaO, HO, as prescribed by Millon, but *quicklime*. His products, obtained by this new mode of treatment, have an agreeable ethereal odor resembling chloroform, and are completely destitute of the disgusting quality usually found in the commercial article. If the distillation is pushed too far the last portions of the distillate develop again the usual disagreeable odor of this substance, owing probably to the elimination of a hydrogen compound. It is suggested that this mode of treatment may be extended with advantage to turpentines and other products which are observed to retain an unpleasant residual odor foreign to the substance in a state of purity. H. W.

India Rubber.—This material is wonderfully elastic, and can be stretched to an infinite variety of shapes and uses. It is singular that no enthusiast has attempted to make a collection of the different articles manufactured from this gum—they would stock a tolerably large cabinet. The latest adaptation of this accommodating substance is about to be made by a firm in Bridgeport, Conn., who propose to build coaches and carriages with india-rubber bodies. This is a capital idea, and might with still greater advantage be applied to city stages and horse-cars. There would then, perhaps, be really always "room for one more," [We recently gave a description of a hard rubber wagon made in this city.—Ed.]

A New Electric Light—Printing Photographic Transparencies by Artificial Light.

At one of the soirées of the British Association, at Norwich, Mr. John Browning, F.R.A.S., the optician who manufactured the great teleseope for the Government of India to photograph the late eclipse, exhibited a new electric lamp, intended to be worked by a Groves battery of six cells only. With such weak power we had no doubt that the lamp would "spit" and flicker considerably, so we considered the instrument of little value. Recently, however, upon going to see the lamp in action—in consequence of reports afloat as to its steadiness—a little examination made it apparent that the new lamp will be a formidable rival to the "lime light," for lecturing and other purposes. In fact, the lamp is constructed upon an entirely new principle.

In ordinary lamps the carbon points are pulled a limited distance apart by an automatic electro-magnetic apparatus, that distance being sufficient to give the maximum of light without breaking the flow of the current. In the new lamp there is no pulling apart of the carbon points, the battery power being so weak that all such movements would be useless. The principle adopted in the case before us is to let the carbon points touch each other, and to clamp them in that position, so that the current has to burn an interval between the two points for itself. In the accompanying



cut, D, D is a brass rod carrying the upper carbon point, and sliding easily in its vertical bearings by its own weight. Directly the upper point touches the lower one the current is established, and the little electro-magnet, A, at once pulls down its armature, which clamps the upper brass end at B. Directly the current is broken by the wasting away of the carbons, the electro-magnet, A, ceases to hold the brass rod, which then falls, and re-establishes the communication. Nothing can be simpler. At the first glance it would be thought that an arrangement like this must give a light which would "spit" and flash with great vigor. Yet the light produced is as steady as a gas flame, or the light from incandescent lime under the oxy-hydrogen blow pipe. As a matter of fact the current does meet with constant interruptions, yet the distance between the carbons is so small that the current immediately recommences its passage, so that in accordance with the law of the persistance of vision upon the retina, the instantaneous interruptions in the light cannot be recognized by the eye. With attention the ear can detect the vibrations of the upper carbon, but the noise is very slight. The light itself does not consist of an infinitesimally small spark between the electrodes, but two carbons are heated for a short distance from their extremities.

All who are practically acquainted with the use of the lime light for photographic enlargements, or lecturing purposes, know that gas-bags will only keep in good working condition a short time, and are very expensive in first cost. Gasometers are objectionable for their want of portability, and the trouble of emptying them and filling them with large volumes of water as well as gas. The new lamp is, therefore, likely to be a formidable rival to the lime light. As the size of the new light is very small it will not do to use in a lantern with bad condensers, because the spots and *striæ* in the glass would then be projected in a visible form upon the screen. In fact, its use will necessitate the adoption in the magic lantern both of good lenses and

good pictures, since imperfections in these are always most conspicuous when a small and brilliant light is adopted in the lantern. In the engraving the lamp is pictured as furnished with a parabolic reflector. For lantern purposes this cannot be used, and Mr. Browning is going to substitute a small concave silvered reflector, of such a curve as to give the maximum of light without indistinctness in the image projected upon the screen.

Photographic transparencies on glass for the magic lantern are usually printed in the copying camera, unless dry plates be used in the work. Much time and trouble is saved by printing these pictures upon wet plates by superposition, but then a few folds of paper or card must be placed between the edges of the negative and the wet plate to keep them from touching, or the former would be spoilt by the nitrate of silver solution. Gas-light is often used to print such pictures, but the length of the flame introduces a certain amount of parallax, because the printing must be done within a foot or two of the burner. Practically, at a distance of two feet, if the negative and wet plate be held steadily in one position, there is no visible loss of sharpness from parallax, and the operator who tries this plan will find that a copying camera is not such a necessary in printing transparencies as it is commonly supposed to be. Nevertheless, a light emanating from a point must be more perfect for such purposes than a broad or high flame; so the new electric lamp is likely to be useful for this purpose also.

A safer, or cleaner, or better illuminating power than the lime light can scarcely be found by those who are experienced in its management, and with such people the question of the adoption of the new light resolves itself into one of cost, brilliancy, and portability. As regards portability, the apparatus connected with the new light has immensely the advantage. As regards brilliancy, we think, from the experiments recently made, that with a proper reflector, and a battery of eight or nine cells, a nine-foot disk can be well covered with an intense light. As regards cost, we have not sufficient data to draw a comparison, but the difference between the two cannot be great. In the hands of experienced persons a dangerous explosion is no uncommon thing with the lime light, and in the preparation of oxygen, neither of which risks are encountered in using the electric light.—*Mechanics' Magazine, from reprint of American Artisan.*

The Gas Supply of Milan, Italy.

In the American Gas-Light Journal of Dec. 2d, we promised its readers that we would copy from the new Italian journal, *Il Gas*, whatever matter of interest it contained. We therefore reproduce, from that paper, the following particulars of the gaslighting of Milan:

In 1787 this city was first lighted up, 1,158 oil lamps being used for this purpose. On the 31st of July, 1845, Milan was first lighted with gas. The streets were lighted with 377 gas lamps, and 800 of the old oil lamps; in all with 1,177 lamps. The price paid for gas was 38 centimes per cubic metre for public lighting, and 66 centimes by private consumers. In 1851, the number of gas lamps was increased to 494, and the price per cubic metre reduced to 35 centimes for public lighting, and 50 to private consumers. The total quantity of gas consumed per annum by the street lamps was 210,295 cubic metres, and the annual expense for lighting the city amounted to 211,913 francs (including the 770 oil lamps which were still used in some of the streets.) The number of private burners was 2.608, which consumed 620,800 cubic metres of gas per annum. From 1851 to 1863, the number of lights, both public and private, was greatly increased; and in 1864 a fresh contract was made with the municipality at 28 centimes per cubic metre, and with private consumers at 45 centimes. The following is the number of lights, both public and private, the annual consumption of gas, and expenditures for lighting Milan, from 1864 to 1867:

	1864.	1866.	1867.
Public Lighting:			
No. street-lamps..	1,794	2,469	3,082
Consumpt'n of gas, cubic metres...	761,306	1,061,154	1,195,638
Annual expenditure, francs....	305,394	295,681	314,227
Private Lighting:			
No. of burners...	20,491	26,127	30,095
Consumpt'n of gas, cubic metres...	1,874,211	2,412,350	2,721,896

The illuminating standard, according to contract between the gas company and the municipality, is, that each lamp shall consume not less than 120 litres of gas per hour, equal to 42 grains of Colza oil burnt in a Carcel lamp.

Purity of Croton Water as Compared with the Water of Other Cities.

Through the kindness of Professor Chandler, of the N. Y. School of Mines, I am enabled to place on record the following highly valuable table, which is extracted from a Report made by him to the Metropolitan Board of Health. The same Report contains the results of extended observations upon the chemical condition of the water-supply of the Metropolis, which I shall also condense for a future issue.—H. W.

Table Showing Purity of Croton Water as Compared with the Water of Other Cities.
Compiled by Prof. C. F. Chandler.
Results Calculated for 100,000 *Parts of Water.*

Cities Supplied.	Source of Water.	Inorganic Matter.	Organic and Volatile Matter.	Total Solids.
New York	Croton: average for 13 weeks, 1867 (Prof. C. F. Chandler)	6.72	1.12	7.84
Brooklyn	Ridgewood* (Prof. Eaton)	4.49	1.79	6.28
Boston	Cochituate (Prof. E. N. Horsford)	4.12	1.22	5.34
Philadelphia	Fairmount, Schuylkill " " "	3.95	2.06	6.01
"	Delaware (Prof. H. Wurtz)	4.97	1.08	6.05
Albany	Hydrant (Prof E. N. Horsford)	14.52	3.96	18.48
Troy	Hydrant (Prof. W. Elderhorst)	10.44	2.30	12.74
Utica	Hydrant (Prof. C. F. Chandler)	9.43	1.64	11.07
Syracuse	New Reservoir " " "	20.81	3.08	23.89
Cleveland	Lake Erie (Prof. J. L. Cassels)	8.13	2.62	10.75
Chicago	Lake Michigan† (Prof. Blaney)	9.63	1.81	11 44
Rochester	Genesse River (Prof. C. F. Chandler)	20.62	2.12	22.74
Schenectady	State St. Well " " "	80.38	4.00	84.38
Newark, Jersey City, Hoboken, and Hudson City	Passaic River Prof. E. N. Horsford)	7.85	4.90	12.75
Trenton	(Prof. H. Wurtz)	5.02	0.95	5.97
London	Thames: Grand Junction Co. (Dr. H. Letheby)	26.67	1.43	28.10
"	" West Middlesex Co. " "	22.60	1.21	23.81
"	" Southwark and Vauxhaull Co. (Dr. H. Letheby)	25.78	1.43	27.21
"	" Lambeth Co. (Dr. H. Letheby)	25.36	1.78	27.14
"	" Kent Co. " "	38.21	1 07	39.28
"	New River Co. " "	23.93	0.35	24.28
"	East London Co. " "	26.71	0.71	27.42
"	Well, Leadenhall street " "	154.98	16.44	171.42
Dublin	Lough Vartry, new supply (Prof. Apjohn & oths)	3.04	2.30	5.34
Paris	Seine, above the city (Bussey, Wurtz and Ville)	13.43	1.70	15.13
"	Reservoir, Montmartre " " "	17.73	3.50	21.23
"	Reservoir, Passy " " "	19.81	3.20	23 01
Stockholm	Maeler Lake (Alex. Mueller)	47.00	7.00	54.00
"	Haga Palace (Dr. Bahr)	27.88	3.26	31 14
"	Well, Hanwerkerstrasse (Alex. Mueller)	389.00	23.00	410.00
Amsterdam	River Vecht (V. Baumhauer and Van Moorsel)	24.78	3.66	28 44
"	Deep well at the Keisersgracht (V. Baumhauer and Van Moorsel)	110.69	7.51	118.10
"	Artesian Well, Bikkerseiland (V. Baumhauer and Van Moorsel)	106.89	2.31	109.20

The Gas Works at Omaha City.

[From the Omaha Daily Herald, December 4.]

In the month of January, 1867, capitalists of this city, realizing that at the rate it was increasing in population and size, a Gas Works was indispensable, applied to and were granted a special act from the Legislature, under the name of the Omaha Gas Light Co., for the purpose of supplying the city with this very necessary and essential article so inadequate to the requirements of a fast and growing town. They therefore commenced the erection of an establishment of this kind. These works are now nearly completed, or sufficiently so to afford a tolerably correct idea of what they are to be.

Your correspondent visited the establishment yesterday, and through the courtesy of the efficient Superintendent and Engineer, J. W. Baker, is enabled to furnish a true subjoined description of one of the most compact establishments of the kind in the country.

In selecting a location for the works it was necessary to choose with reference to water and railroad communication for the purpose of convenience. Accordingly, by the advice of their engineer, they selected and purchased a lot of ground on 12th and Leavenworth sts. The works cover the entire block.

Commencing with the manufacture of gas, we first come to the Retort House, a building 95 feet in length by 26 feet high. The walls are of brick, sixteen inches thick and twenty-four feet high above the solid stone foundation, and are surmounted by an iron truss roof, similar in style to those which cover all of our large railroad depots. It is roofed with the best quality of slate.

The retort house contains eight stocks, or clusters, of retorts, each of which contain five retorts. Under each bench a fierce fire is made, and the coal is converted into the crude gas, leaving the coke in the retorts. From the retorts a pipe conducts the gas to the hydraulic main above, where it is received and is partially separated from the tar, which drains into the tar-wells by. From the hydraulic main the gas is delivered through a syphon to a twelve-inch main, by which time it is freed from tar. The coke yard, in which is placed the tar-wells, receives the coke as it comes from the retort room.

Next we enter the exhaust and engine room. To the former the gas passes to the hydraulic main. Portions of the impurities are here exhausted preparatory to the next process. The engine is of the Washington make, of New York. The engine is of 12-horse power. After having passed through the exhauster, the gas next enters through the twelve-inch main to the Condensers. It first passes into the washer, a tank or pipe eighteen feet high, divided into two partitions, into which the gas is brought into contact with jets or sprays of water, and is thereby practically cleansed of the oils and volatile substances which cling to it after the tar has been separated.

From thence it enters the condensers, a large iron tank surrounded by water, which cools the gas as it passes through the pipes. The washer and condenser occupy the western wing of the building, and provision has been made for an extension when required.

After leaving the condensing department, the gas passes through a twelve-inch main to the Purifying House, which is a room adjoining the retort house, and contains four large purifying boxes, into which the gas is conducted after having passed through the center seal. The purifying boxes are shallow iron tanks 12 by 8 feet, and contain six layers of lime, which is prepared in the lime room, and which constitutes the last purifying process to which the gas is subjected. This accomplished, the gas is ready for consumption, and poceeds thence to the Station Meter. The meter occupies a room adjoining the purifying house, is seven feet in diameter, and is capable of registering from 50,000 to 75,000 feet per hour, although constructed precisely as the small house meter. After having been registered in the meter room the gas is conducted to the gasholder, there to remain until used. The holder is one of the largest single lift holders in the country, having a capacity of 200,000 cubic feet of gas. It is ninety-seven feet in diameter by thirty-six feet high, and swings upon eight wrought iron columns, each of which are twenty-five feet high, surmounted by cast iron girders. These columns are secured to large granite stones on the top of the walls of the tank. The thickness of these walls are two feet six inches, firmly imbedded in the best cement, with grouting of gravel

and cement one foot thick in the back of them. In the construction of this immense pit there was used 550,000 brick.

The establishment, as a whole, is as neat and compact works as we have ever had the pleasure of inspecting, and will well repay a visit. In it will be employed about fifty operatives, and as the consumption of gas increases, so will the consumption of coal, until it reaches twenty thousand tons of coal per year.

The machinery and appliances throughout are neat and interesting, all of which, as also the pipes for the streets, were supplied by Dennis Long, of Louisville, Ky.; station meter and the smaller ones by Harris & Bro., of Philadelphia. The entire construction has been personally attended to by the Superintendent and Engineer, Mr. J. W. Baker (of the firm of Baker, Purnell & Frye, of this city,) who has supervised every portion of the work.

The works as they at present stand have cost $150,000. From present appearances, and everything goes on well, the works will be finished and the gas ready for the city's use about the 1st or 10th of January, 1869. G. W.

The *Omaha Republican* of December 3d, 1868, also has an article on the new gas-works, which we transfer to our columns. It is as follows: We spent a few moments at the works of the Omaha Gas Company yesterday forenoon. We were much pleased at observing their advanced stage of progress, and the extent and excellent character of them. While there we met the efficient and gentlemanly superintendent under whose supervision they have been constructed, and whom we found up to his ears in the active labor of driving them to rapid completion; yet who, with the courtesy which is characteristic of him, put himself to the trouble of giving us many items of information in regard to the works.

The retort house is a fine brick structure 26x95 feet in dimensions. In it are now being constructed the "benches," eight in number, and designed to support "retorts." Just south of it is the gasometer, one of the largest single lift holders in the United States, and a monster looking thing. The measurement of its capacity is 150,000 feet of gas, and it will supply 300,000 feet nightly to consumers. Just east of these portions of the works a frame coal house, 25x75 feet in size, is now in process of construction. Besides these there are several other buildings to be constructed, which will be done as rapidly as possible. The gasometer, complete, purifiers, retorts and all the iron castings for the works, together with all the cast gas mains (over 300 tons) were manufactured at the extensive Iron Works and Pipe Foundry of Dennis Long, Esq., Louisville, Ky. The estimated cost of the works is $125,000. They will be in operation, and our city lighted with gas, about the 1st of January.

Machinery for Charging Retorts.

This apparatus is now in successful operation at the Dublin Gas Works, of which mention was made by Mr. Barlow in his Inaugural Address to the British Association of Gas Managers (GAS-LIGHT JOURNAL of Sept. 2, 1868, p. 131.) The following additional details of experiments conducted by an English firm, which we find in a London exchange, will prove interesting to American readers:

"An interesting and successful trial of Messrs. Holden & Best's patent gas retort charging and drawing machine has taken place at Messrs. Handyside's Britannia Foundry, Derby. The machine travels on rails from one end of the retort house to the other, immediately in front of the benches of retorts, and consists of three long wrought iron rakes, mounted one above another on a movable carriage; also three long scoops mounted on a similar carriage, and in the same relative position as rakes. These carriages travel on a strong wrought iron cradle. This cradle also carries the engines and boilers that actuate the machine and propel it along the rails. The action, as described, is exceedingly simple, most of the motions are self-acting, and so precise and regular that one might almost fancy the machine was endowed with intelligence. The usual average time for drawing and charging a bench of nine retorts by manual labor is forty-five minutes; this machine accomplishes the same amount of work leisurely in ten minutes, and has drawn and charged that number in six minutes. In labor the machine dispenses with fifty-four men out of seventy-two. The reduced time necessary to keep open the retort-doors effects a very considerable saving. In dispensing with so many men, the experience of the Alliance Gas Company, Dublin, is said to prove that the machine does its work for something under 9d. per ton, whereas, by manual labor, it used to cost them about 2s. per ton. In a gas work carbonizing 1,000 tons per week, at 2s. per ton, this would cost 100*l*., while with the machine, at 9d. per ton, the cost, it is said, only amounts to 37*l*. 10s., thus saving 62*l*. 10s. per week."

Electric Illumination.

SUNDRY EXPERIMENTS RELATIVE TO THE PRODUCTION OF ELECTRIC LIGHT, BY F. P. LE ROUX.

[From the London *Chemical News* October 16.]

The brilliant phenomenon, now popularly known by the name of electric light, was first discovered by Sir Humphrey Davy; who, in 1813, conducted the current of a powerful pile between two pieces of charcoal. For more than half a century mankind has been dazzled by this light, whose brilliancy is comparable only to the sun, and yet many theoretical questions as to its intimate nature remain to be solved, and many practical difficulties with respect to its extended employment to be removed. The experiments which form the subject of this article may be found interesting from both points of view.

On the Nature of the Voltaic Arc.—In order to examine in detail, and without fatigue, what takes place between the two pieces of charcoal in Davy's experiment, the phenomenon should be projected upon a screen, that is to say, an augmented image should be produced by means of a lens, an experiment which is now common. Two salient traits of this phenomenon will now be remarked; on the one hand, the vivid incandescence of the points of charcoal, which glow with the brilliancy of the sun; on the other, the soft bluish clearness of the intervening space.

This bluish space generally presents the appearance of a conical trumpet, whose larger extremity rests upon the positive, and its lesser upon the negative point of charcoal. The slightest breath will alter the shape of this bluish light, which curves from its centre in an opposite direction to the breath, while its extremities continue to rest on the most incandescent points of the charcoal; this has led to the conclusion that it is produced by a highly rarefied substance extending between the charcoal poles.

At the time these experiments were first made it was usual to arrange the charcoal points in a horizontal line, where the ascension of currents of heated air naturally produced the incurvation above described, and led to its receiving the name of the voltaic arc; this name it still preserves, although it is no longer justified by the external appearance of the phenomenon, owing to the vertical arrangement of the charcoal now general.

The voltaic arc may be distorted or even broken by the proximity of a magnet; the sensible effect of a magnet on the arc is similar to that which it would have on a highly flexible circuit, permeated by the same current as the intervening space. It is evident that the voltaic arc is exactly the route taken by the electric current in passing from one point of charcoal to the other.

A glance at the whole phenomena will suffice to show that the quantity of light proceeding from the arc itself is minimum, and that the incandescent surface of the charcoal is the true source of the so-called electric light; but the portions of that surface, where the incandescence is incomparably more vivid than elsewhere, are the extremities of the sticks of charcoal, just at the places between which the arc extends.

What then is this arc? It is evidently composed of that constituent of the charcoal, which experience has shown to be conveyed from one point to the other. What form does then this matter take during its passage? Is the carbon merely disseminated as an excessively fine dust, or in a state of gas? This has not as yet been definitely answered, but some experiments which will presently be described, tend to cause the belief that carbon exists in the arc under the form of vapor.

One circumstance which is immediately perceived on examining the pieces of charcoal is the great difference in their temperature. The positive charcoal is considerably more luminous than the other, and its incandescence extends over a longer duration. I am even inclined to believe that the negative charcoal is heated almost entirely by the radiation of heat from the positive charcoal on one hand and the arc on the other, and by the heat proceeding from the condensation of the matter conveyed by the latter. I have made one experiment of a very simple kind, but which, however, I have never heard described, which will show that the heating of the positive pole is owing to a special cause, the seat of which is the exact point where the voltaic arc joins the charcoal. The experiment consists in this: The charcoal electrodes are first brought into contact in the ordinary manner, and then separated so as to produce a very short arc of only a small fraction of a millimetre, which is interrupted at the end of some seconds: the positive electrode will then be found to remain incandescent for some time, whilst the extremity of the negative electrode will be scarcely red. By this mode of operation the heat evolved by the arc is almost entirely eliminated, as the latter from its shortness offers feeble resistance, and is consequently the seat of but a slight disengagement of caloric. If, on the other hand, the extremity of the positive charcoal be really the source of evolution of caloric, one would suppose that the caloric would communicate itself more rapidly by interior conduction to the mass of the positive charcoal than by radiation to the negative charcoal, and that if the passage of the current were interrupted for a few moments, a marked predominence of the first of these effects would be apparent; this, the experiment shows to be the case. There exists, then, at the positive pole, a special source of evolution of caloric hitherto unexplained, but which does not, to me, appear inexplicable; I shall, however, revert to this subject in a special publication.

Employment of a Current of Oxygen for Disposing the most Luminous Portions of the Charcoal to Greater Advantage.—It has just been remarked that the greater proportion of light arises from those portions of the surface of the electrodes, between which the arc arises; that of the positive pole is slightly concave, that of the negative more or less convex; that of the positive pole exceeds the other both in size and brilliancy. As it is usual to arrange the electrodes in the same vertical line, the illuminating surfaces in question are necessarily presented obliquely with regard to a horizontal direction, which is generally that in which the light is used. If from defective homogenity of the charcoal, or any other cause, these surfaces should bend in any direction, the illuminating power will be seen to vary in that direction also. With such charcoal as that produced by gas retorts, the only kind now obtainable in the present state of commerce, and very impure, the disturbance of the arc is perpetual, and in photometrical measurements the illuminating power of an electric lamp is seen to vary at each moment within extensive limits. I believe that if the arc could be made to remain always inclined in a given direction—that is, towards the side on which the maximum of light is desired to be thrown—that the steadiness of the light would be secured: this was satisfactorily proved to be the case; the arc being forced to incurve, the surfaces which formed its base were so much the more vertically inclined, and the light thereby more clearly directed towards the region desired to be illuminated. It is particularly necessary that the current of gas should incline the electrodes in a different direction to that in which the arc is bent, otherwise they will approach each other too closely, and the arc, choosing the most direct road, will also change its position. It is exactly this combustion of the charcoals, which is performed by a current of gas, which turns them towards two eccentric points, between which the arc naturally maintains itself so easily that the slightest force is sufficient to incurve it as we have described. The gas pipe should be placed at about one centimetre from the charcoal electrodes, and slightly below a horizontal plane passed between them, in order to combat the tendency acquired by the gas as it heats to flow in greater quantity towards the upper electrode. A good result is obtained by causing the gas to escape by two holes of about one millimetre in diameter and one millimetre apart; the consumption of oxygen is not great, and may be estimated at about 15 litres per hour. It is of course understood that the conditions must vary with the size of the electrodes and the force of the electric current employed, the stream of gas being weaker in proportion to the diminution in the size of the electrodes.

I should recommend all who desire to put this experiment into practice to carefully isolate the tube containing the gaseous current, as without this precaution the arc might come in contact with it, and cause its instantaneous destruction.

Arrangement for Subjecting the Voltaic Arc to Spectral Analysis.—The image of the voltaic arc and luminous electrodes being already thrown upon a screen, let us conceive a small opening to be made in that part of the screen upon which the arc is projected, and thus an extremely simple means is obtained of isolating the light emitted by the arc from that of the electrodes. By placing the slit of a spectroscope behind this opening the character of the light emitted by gaseous substances is instantly perceived—namely discontinuity. The spectrum of the voltaic arc is perhaps the most beautiful spectacle offered by the spectroscope: it appears to me to resemble most the spectra observed by MM. Plucker and Hittorff during the combustion of cyanogen in oxygen, and also by M. Morren in that of carbon.

I intend to make an exact determination of this spectrum as soon as it is possible to use a purer carbon than the charcoal of gas retorts; at present we can do no less than infer the presence of gaseous carbon in the voltaic arc. The proceeding just described may perhaps be also applicable to the examination of different portions of other kinds of flame; it will be only necessary to place a screen at the distance of about a few millimetres from the slit of the spectroscope, and to there project, by means of a lens, the image of the flame to be examined; by this means it may be ascer-

tained at any moment what part of the flame is under the spectral analysis.

Spontaneous Re-appearance of the Voltaic Arc after an Interruption of Short Duration.—About 20 years ago, M. de la Rive, when studying the effect of magnetism on the voltaic arc, succeeded in producing it between bars of soft iron; he then observed that under certain conditions the arc was sometimes broken by the influence of an electric current circulating around these bars, but that if the disturbing influence was removed before the poles had cooled, the arc sometimes re-appeared without obliging him to bring the poles into contact.

Ten years later M. Wartmann, of Geneva, in experimenting on the practical application of electric light, proved that "it was possible to suspend the circulation of electricity between two charcoal electrodes during 1-20th of a second, without, he says, the arc disappearing."

M. Wartman considered that, for a certain time after the interruption of the current, certain solid particles remained interpolated between the two poles. I was led to a more detailed study of these phenomeno, by endeavoring to give some description of the production of electric light by means of magneto-electric machines, in which case the current changes, as is well known, many times in a minute, and must therefore of necessity pass by zero—that is, it must be interrupted.

The first question to be asked is, Is the arc really interrupted at the same time as the current? Observation has proved that the arc really ceases to exist during the interruption of the current; the following is a convenient method of demonstrating it to a numerous audience.

At the end of a pendulum, beating about every half second, is suspended a screen upon which the reflection of the electrodes is thrown by means of a lens; by this contrivance the reflection of the electrodes is displaced upon the screen. Consequent upon this is the displacement of the image formed upon the retina, whose sensation is thus rendered less obtuse than it would be were the image continually in the same place, and the changes of short duration which the object under examination may undergo are more easily perceived.

These arrangements being finished, the two electrodes are placed at a distance from each other of about two millimetres, and there fixed (if they be mounted on a regulator the movement must be stopped), and the current is then interrupted by the hand for a period not exceeding 1-20th of a second. This interruption may be more easily made by a spring plate working against a catch, the arrangement being such that the separation may be made by a downward movement.

It will be clearly perceived that the violet light constituting the arc disappears at the moment when the current is interrupted.

This interruption may be repeated a large number of times per second (we shall presently recur to the use made of this fact in the division of electric light) so that the electrodes may be examined during the length of the interruptions only, by an apparatus somewhat resembling the phosphoroscope of M. Edm. Becquerel; the interruptions are effected by the apparatus itself, and thus the condition of the intervening space may also be examined during the same period. Economical motives have hindered me from realizing this project, and I may here add that the kindness of M. Serrin first enabled me to effect the experiments which form the subject of this communication.

[To be continued.]

The New York Society of Practical Engineering.

[*Reported Expressly for this Journal.*]

Owing to unusual pressure of other matter, the proceedings of the New York Society of Practical Engineering was omitted in our previous number. The fortnightly meetings were held as usual on the evenings of December 8 and 22 respectively, James A. Whitney in the chair.

At the meeting of Dec. 8th the regular subject for consideration was "Modern Improvements in Mining Apparatus." The author of the paper, Mr. William B. Harrison, gave a sketch of the progress of mining operations from the first endeavors of man in the way of mining, to the present day. Especial attention was given to the subject of explosive materials, gunpowder, nitroglycerine, etc., as regards mining, tunneling, etc. The pumping engines in use here and in England were also considered.

After the reading of the paper, Dr. A. W. Hall spoke of his experience some years ago, as regards the separation of the granular gold from the black sand. The latter, he said, caused much difficulty owing to its great weight. The difficulty was overcome by the process of amalgamation, varied, however, by coating copper plates with mercury, whereby a large surface was exposed with much less expenditure of mercury than formerly. He also described a process of his own for the purpose of amalgamation. This device effected the amalgamation by passing the pulverized ore suspended in a stream of water through a conducting syphon the long arm of which was bent upward in order to retain therein a quantity of mercury. The gold unites with the mercury and is separated as usual.

Mr. Lewis, formerly a resident of California, spoke of hydraulic mining The water, carried for considerable distances by canals or conduits, is thence conveyed by a large hose made of duck to the spot required. The water from the hose is driven against the precious embankment, the stream being guided by a flexible hose and nozzle. The embankment is quickly torn down, and the débris passes into sluices, where the gold is separated by amalgamation. Ores containing no more gold than ten dollars worth to the ton can be thus made to yield a profit of five dollars to the ton.

Another gentlemen spoke of the value of superheated steam in the calcination of the sulphurets. Some silver ores must be pulverized in a very dry condition, for the sake of economy. As a good method, he instanced the employment of stamps working in an air-tight chamber, from which an air-blast carried the fine particles as fast as formed into another chamber where they were allowed to settle. This fine powder is then submitted to chemical treatment.

Dr. J. V. C. Smith, ex-Mayor of Boston, gave an interesting account of his observations in Asia Minor, and also spoke of an interview with Baron Von Humboldt, who claimed to have discovered the gold-mines of the Ural Mountains.

During the discussion the president spoke of the difference between the rude mining of former times and the more civilized labor of to day, in that the object of the former was to obtain the metal in nature, in its metallic state; while, in the present age, the elaborate and costly processes bring the metal from any of its combinations. Many of the most valuable mines in the world world were discovered by accipent: as, for instance, South America and Freiberg, Germany.

Some further discussion ensued on the subject of mining machinery, and a model of an ingenious means for removing deposits from sewers was exhibited by Mr. J. Harrison, of New York city, after which the meeting adjourned.

At the later meeting, held Dec. 22d, the subject of "Marine Disasters and the Means of Preventing Them" was considered, and a paper on this topic was read by Mr. C. Williams, of this city.

The causes of marine disasters, according to the writer, might be divided into several classes. The foundering of vessels in gales, or in ordinary weather, from derangement of machinery, or springing of leaks, errors in reckoning or sounding, and the effects of fire were among the causes mentioned. As to the first of these, he proposed such construction as would ensure their floatation even when they are badly stove, as by a careful arrangement of water-tight compartments; in the case of a vessel sinking, he suggested as a means of rescue for passengers and crew, the use of a floating "storm-proof" to serve as a life raft. As regards danger arising from leaks, he recommended the more extended use of steam pumps, especially on sailing vessels. As a safeguard against fire, the timber used in ship-building should be impregnated with some metallic substance to render it non-combustible.

In the discussion which followed, Dr. Parmelee said that wood could not be rendered wholly fire-proof by any process of impregnation with minerals now known, and as to fire-proof paints, mentioned in the paper as a partial preventive against fire, they would not be found to be of much value. The wood being split by the heat, the flames would pass into the interstices and set it on fire almost as readily as if there were no fire-proof paints present.

Lawrence Holms agreed with his predecessor as to the little value of the so-called fire-proof paints. Mineral impregnation by forcing the fire-proofing substance into the pores of the wood in a vacuum-chamber is the only way by which non-combustibility in wood can be even approximately attained.

Dr. J. V. C. Smith spock of his entire want of belief in the utility of wood as a fire-proof material for ships. Vessels should be built of iron on the cellular plan, and burning and wrecks would be almost impossible.

Dr. A. W. Hall described a bulkhead for steamboats navigating rivers where there is danger of "snagging." A water-tight compartment in the bow and sides of the vessel forms the bulkhead, and thus the buoyancy of the hull will not be affected by an opening made by running against a "snag."

The discussion continued for some time, after which the society adjourned for two weeks, when the subject of "Concrete and Concrete Buildings" will be considered.

Fire Clay.—A good article of clay has been found at Michigan Bar, Sacramento County, Cal., where a pottery has been established, and fire-brick turned out equal to the best English imported, having been used in Coney & Bigelow's furnaces.

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—Eds.]

A Correction.

Boston, December 16, 1868.

Messrs. Editors: Near the close of an article entitled "About our Coal Interest," in the December number of your Journal, we note a very great error made by the writer in the following sentence: "The duty on all foreign coal is $1.10 per ton of 28 bushels," which you will allow us to correct. The duty on all foreign coal ever since June 30th, 1864, has been $1.25 *per ton in gold.*

On March 2nd, 1861, Congress passed an act making the duty on foreign coal $1 per ton of 28 bushels, and in the following year, July 30th, increased the duty 10 cents, making $1.10 per ton of 28 bushels, and on the 30th of July, 1864, the duty was made $1.25 *where it has remained ever since.* Yours truly,

Bird, Perkins & Job.

Answers to "Enquirer."

Knoxville, Tenn, Dec. 23d, 1868.

Messrs Editors: I would suggest to "Enquirer" to put a pressure guage on the end of his main already laid and ascertain what amount of pressure he has. If it is the same as at the works a two-inch pipe will answer the purpose; but if it is much less, and any likelihood of consumption from it, I would lay a three-inch all the way. Of course the pressure can be increased at the works by weighting the "holder" while the other was filling. Respectfully,

Jas. Somerville,
Sup't Knoxville Gas-Light Co.

Fort Wayne, Ind., Dec. 23d, 1868.

Messrs. Editors: In answer to your correspondent, "Enquirer," I would say that, providing he wishes, as stated in his letter, to deliver 2000 cubic feet of gas of ordinary specific gravity, say .400, a distance of 2½ miles (or 4,400 yards) in the space of 9 hours (222.2 cubic feet per hour) with a difference of pressure of 1½ inches water, he can do so through a two inch pipe all the way—throwing in as many ups and downs as he likes; but if from this pressure of 1½ inches the weight of a holder has to be taken, a necessary element in the calculation will be the weight in inches pressure of the holder.

If "Enquirer" wants to deliver 20,000 cubic feet, as seems more likely (assuming 2,000 to be a misprint), he would have to employ 90 inch! pressure through a six, four, three, or two-inch pipe in the proportion mentioned; but by lengthening the six to about 1500 yards, and laying a four in the balance, under ordinary pressure, 20,000 could be delivered. Yours truly,

H. H. E.

Accident at South Bend (Ind.) Gas Works.

South Bend (Ind.), Dec. 22d, 1868.

Messrs. Editors: You will see by the paper sent you that the city of South Bend was lighted with gas for the first time Friday, 11th inst. You will find also a very *luminous* description of how gas is manufactured at South Bend, which description I believe is *original.* I did not, however, write to call your attention to this, but to give you a correct account of an accident that occurred at these works at 2:30 A. M., on the 17th inst. The man at the works said he noticed a strong smell of unpurified gas, and entered the purifying house to find out where it came from, but before he could discover this he was almost suffocated, and was in the act of leaving when the explosion took place, throwing the back and end walls down and allowing the roof (which is of slate) to fall in on top of the purifiers. He says he could not find the door, and scrambled out over the broken wall, terribly frightened, but without a scratch; he then ran for the superintendent, who lives at some distance from the works, and who on his arrival found the fire engines playing vigorously on flames issuing

from the top of the condenser; it was but the work of a moment for him to enter the meter room, shut off the inlet valve to the holder, and then strike off the lids of the retorts, which rather astonished the firemen at the sudden disappearance of their fire. I may here mention that the superintendent told me that he never saw a fire at which there was so much room to work. As soon as daylight appeared men were set to work to clear the *debris* off the purifiers and condensers, which on examination were found uninjured, and gas making went on as if nothing had occurred, and the city was lighted at night as usual. By 10 A. M. masons were at work on the walls, and at the time I write, to see the works, you could not tell that a fire had happened. The cause of the accident was found to be the lifting of the condenser cover, from which the gas escaped, and was carried by the current of air through an opening in the wall to the retort house, where I suppose it ignited, thus causing the explosion. When are we going to have Smedberg's book? Truly yours,

OUT WEST.

Smedberg's "Synopsis of Gaslighting."

The following subscription to the above work is acknowledged, making in all 203.

Joseph Shackleton, Rahway, N. J.

Fodell's System of Bookkeeping.

The following subscriptions to "Fodell's System of Book-keeping for Gas-Light Companies" have been received, making in all 36:

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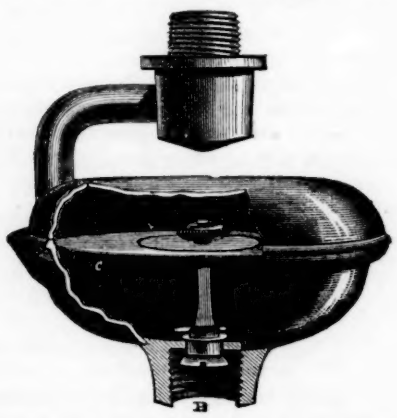

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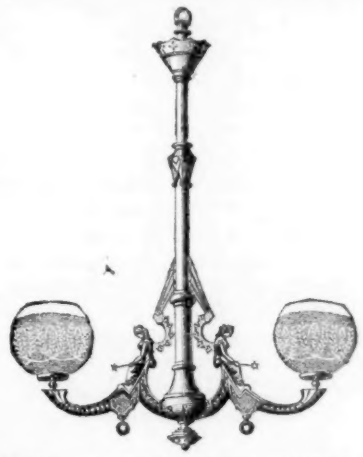

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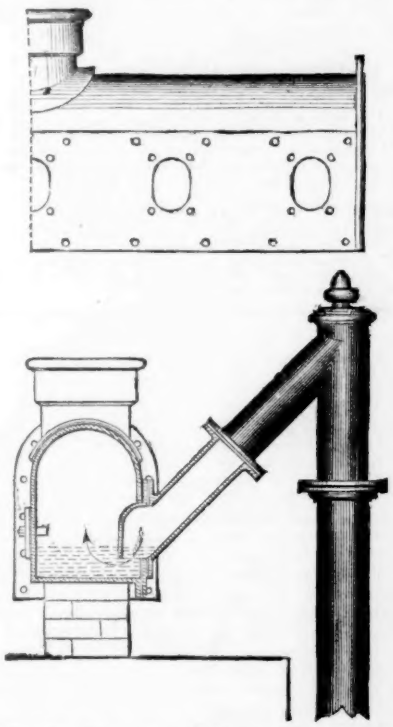

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EDITORS AND PROPRIETORS.

Consulting Chemist,
Geologist and General Scientist,
PROFESSOR HENRY WURTZ.

[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

SATURDAY, JANUARY 2, 1869.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

Subscribers would confer a favor upon us by remitting *CHECKS* or *POST OFFICE MONEY ORDERS*, as we are frequent losers where money is enclosed in letters.

☞ NEWS AGENCY.—The American News Company, 119 and 121 Nassau street, New York, are agents for this Journal. Newsdealers will please send orders to them.

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NOTICE.

☞ *All Collections for Advertisements, Subscriptions, etc., are made directly from this Office. We have Agents to solicit the same, but they are not authorized to Receipt for Money.*

☞ We desire our subscribers and patrons to send all remittances in Checks or Post Office orders to insure safety. If money is sent and lost *we cannot be responsible*, when a little care will so easily avoid a contingency.

Answers to Correspondents.

J. H. B., of N. Y.—The cheapest method known of purifying hard water is to filter it through a mixture of sand, gravel, and wood ashes. Organic matter can be precipitated by means of a little pulverized alum. A tablespoonful sprinkled into a hogshead of water, and stirring it at the same time, will purify it in a few hours.

W. H., of Vt.—According to Bunsen, gaseous bodies are absorbed by liquids, on which they exert no chemical action, in quantities dependent upon—

1st. The essential nature of the gas and of the absorbing liquid.
2d. The temperature.
3rd. The pressure to which the gas is subjected.

Bunsen's work on gasometry will give you much information on the subject, as the loss of absorption are there expounded in a thorough manner.

J. D., of Ohio.—Oxygen gas was discovered in 1774 by Priestly, a celebrated English chemist, and not by Lavoisier as you incorrectly suppose.

X. Y., of Tenn.—William Murdoch was the first man who applied gas to practical use as an illuminating agent. Some French writers attribute the utilization of gas to Phillip Le Bon, the date of whose experiments is not fully known. Murdoch's claims to this distinction, however, are the best authenticated, and he is justly entitled to the honor of being the pioneer in this wholesome reform.

THE NEW YEAR.

On taking a retrospective view of the year which has just passed away, fruitful as it has been with the gravest incidents of a political nature to our country, it does not suggest the occurrence of any remarkable events connected with those subjects which claim our particular attention. Our endeavor has been to present a faithful record of all subjects of interest connected with the specialities to which the Journal is devoted, and also to spread before our readers reliable intelligence concerning the progress of gas lighting both at home and abroad. How well we have fulfilled this task is not for us to say; but it is with no small degree of satisfaction that we acknowledge many evidences of appreciation on the part of our subscribers, and we are happy to state that the number of our patrons is gradually and steadily increasing, and nothing shall be wanting on our part to make the GAS-LIGHT JOURNAL worthy of their support. It will be seen, as an evidence of our intention to do so, that we have secured the co-operation of Professor HENRY WURTZ (whose long experience and knowledge in scientific matters is well known), who will supply our columns with much valuable information and facts upon the subjects our Journal is devoted to, which we trust will not only be interesting to our readers but valuable for future reference, as our articles will be reliable.

In this connection we desire to refer particularly to the valuable feature we have added in the "Chemical Repertory." Under this head will appear much valuable matter of an original character; *also a digest of the most reliable late foreign chemical and scientific news, several weeks in advance of any other publication in the English language.*

Late important American and foreign patents, more especially chemical and scientific inventions and improvements will receive attention, and whenever of materialimportance, a full description and illustration.

We also desire to state that we are doing a general patent business, and have every arrangement both in Washington and abroad to obtain patents with facility and despatch. We particularly solicit cases for re-issue, and those cases which have become obstructed or abandoned owing to improper management or neglect.

In regard to new inventions, it will be seen by a glance at the list of patents which we publish in each number of the Journal, embracing those connected with our specialities, that several new processes connected with the production of gas have been brought forth. So far we have heard of no great revolutions caused by, or likely to be, by the adoption of new apparatus, with the exception of the late improvements and practical demonstrations of the Gwynne-Harris or Hydro-carbon Process, as it is sometimes called. This process is now admitted by gas experts and scientific men to be the the greatest improvement in the manufacture of legitimate coal gas, since its first introduction as an illuminator; and we feel confident it will rapidly come into general use in all our coal-gas works. The exceeding cheapness with which hydrogen is produced by this process will doubtless soon make "gaseous fuel" popular, to the exclusion of coal or wood in our more populous towns and cities. It will also supply a new motive power that will compete with steam in many cases.

In the details of gas manufacture no improvement probably, will take precedence of the new purifying process lately introduced at the Manhattan Gas Works of this city, a report of which, by Professor WURTZ, has been published in pamphlet form, and noticed in this Journal. We will, shortly, publish this report in full, to favor those interested in this branch of manufacture. The use of petroleum has been connected with nearly all the new inventions in the improved processes for the manufacture of gas.

In conclusion we wish a Happy New Year to all our friends—and enemies, and commence the New Year on terms of peace with all men. Having no ulterior or selfish objects in view, we present a clean record of our past actions, and an honest intention for the future.

CITY SEWERAGE.

The importance of a thorough and effective system of sewerage in a large city, is too patent to the minds of intelligent observers to need a word of argument in its support. But although a mental assent may be given to this proposition, in too many instances the spirit of inactivity and procrastination which characterizes the actions of the authorities amounts almost to a virtual denial of its truth; and so far as any practical results ensue, a contradiction of the proposition would be quite as productive of good as if it were allowed and yet not acted on. Such it seems to us has been the way in which the sewerage question has been treated in this city, and such, we fear, will continue to be its fate, until its absolute importance is forced upon the public by the occurrence of some calamitous epidemic.

The question of providing a better system of sewerage than that now in operation in this city, has occupied the attention of men of science for years, and has been the theme of many an article in the scientific and daily papers. Perhaps no city in the world is more favorably located than our own for a well-devised system of drainage. The natural formation of the soil and the close proximity of the rivers serrounding the island greatly facilitates the construction of sewers. To these natural advantages may, in a great degree, be attributed the absence of a regular system, which characterizes the sewerage of the lower and more compact parts of the city, and which have enabled even badly designed sewers in those localities to do their work with tolerable efficiency.

The evils arising from this want of system are, however, very apparent and constantly increasing. With few exceptions the existing sewers have been constructed in detached portions as applications have been made for them to the Common Council, their length and directions being controlled by the petitioners themselves, with little or no regard to ultimate consequences. Every heavy rain washes hundreds of tons of street dirt into the sewers, and it is deposited at their mouths, especially along the Hudson River, whence at low tide it is laid bare in the sun to spread its noxious exhalations over the city. This stench has, at times, been charged to the Gas Works, but the main cause is the deposit of filth from the sewer mouths. It is swept up and down by the tides, and collects in immense beds between the jutting piers.

The neglect of a proper system forced the rebuilding of many of the London sewers, at an enormous cost to that city. We should take advantage of information thus acquired, of experience so dearly bought ny others, by adopting at once such measures as may be practical for devising and perfecting a system of sewerage for those portions of this island as yet unprovided with sewers. A proper system of sewerage follows, with little deviation, the laws governing the motion of fluids, the area to be drained determines the dimensions of the main outlet and its branches. Sewers thus constructed are more efficient in their work, cheaper in first cost, and less expensive in repairs and cleansing.

The smallest sewer in Paris is some seven feet in

height by four in breadth, and the largest about thirteen feet in height and seventeen in breadth. The former is an ovoid shape, and affords ample space for a man and a wheelbarrow. The largest sewer is divided into three parts, the two lateral ones forming foot pavements, and the middle one a gutter or drain some four feet broad. On each foot pavement a series of iron posts support a water pipe, varying in diameter from three and v half to two feet. In soue of the galleries there is but one water pipe. To cleanse the drain a small cart running on iron rails laid along the bottom is pushed forward by two men; the front of this cart is provided with a drop plank, acting like a sort of sluice, which, when down, exactly closes the section of the gutter, and pushes all the mud before it as the cart advances.

But the most important feature of the Paris sewerage system is a syphon, by which the foul waters of a large city are carried under the bed of the Seine to a proper outlet. This syphon is an enormous pipe of wrought iron, having an interior diameter of three and a third feet, and some seven hundred feet in length, which is sunk several feet below the low water mark. The general collector, into which all the secondary ones pour their floods, is a stupendous work, and probably without a parallel in the world. It is sixteen feet in height and eighteen in breadth, with a length of about 18,045 feet in nearly a right line. The foot pavements in this immense subterranean avenue are some six feet, the central drain is nearly eleven feet in breadth with a depth of five feet; so large in fact that a good sized boat is kept afloat on it for the purpose of cleansing. Four boats in all are kept constantly employed in this work, and it takes sixteen days to cleanse the whole length. Ventilation is provided for by air traps at certain distances, and the gallery is lighted with oil lamps.

Even our sister city of Brooklyn, and the more distant city of Chicago, afford examples in this respect which we, with great propriety, may follow. They have each matured and carried into effect a general system of sewerage which cannot but promote in the future the interests, convenience, and health of their inhabitants. That we may also reap similar benefits authority should be given to the Croton Aqueduct Board, with its present able and experienced Chief Engineer, to undertake and complete, at the earliert possible day, the necessary surveys, and to prepare in duplicate such drawings and plans as in their judgment are required.

The cost of reconstructing the sewers of New York will be less the sooner it is begun. We believe it cannot be avoided. The old lines of excavation will answer as far as they go, needing only enlargement, and perhaps much of the tributary work of the smaller streets may be preserved. At all events any further building ot sewers on the existing scale ought to be prevented, and a bureau of engineers constituted to take charge of the subject with a view to a permanent, effective and economical system of sewerage for the whole island.

NEW GAS CARBURATOR.

We are writing by the light produced by city gas enriched by the vapor of refuse petroleum or "dead oil." Two burners of less than two feet each light the room, equal to an Argond burner consuming eight feet per hour.

The peculiarity of this invention consists in placing the carburetting vessel over the light, so the heat will evaporize it and charge the gas on its passage through it before its exit to the burner.

The hydro-carbon or oil is of low gravity and not inflammable or explosive which, together with its extremely low cost (10 cents per gallon) will recommend it to the public as a safe method to enrich common gas of low candle power. It is the most simple and satisfactory method of carburating gas we hove ever had the pleasure of using, and we doubt not it will become popular with all who desire to obtain a strong light at a minium of cost, simply by a little extra care and attention.

The inventor, James Kidd, has an office and sample room at 74 Maiden Lane, where it can be seen at all hours.

THE KEYSTONE IRON WORKS.

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Mr. Kraft was one of the first patrons of this Journal as early as 1859 (ten years ago), and he still appreciates the advantages of advertising, as may be seen by his card on page 202. We cheerfully commend him to the public and gas men as thoroughly experienced, practical and reliable.

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SPECIAL NOTICES.

☞ We desire to direct the attention of all manufacturers of gasworks and gas materials, contractors, engineers, and meter manufacturers, etc., to the advertisement of W. P. Fodell, Esq., on page 173. This work, which is now ready to publish, will go extensively into the hands of Gas Companies, Superintendents and gas men generally, and will be an excellent and very economical medium to advertise in. The author gives us the following schedule of prices, with or without cuts:

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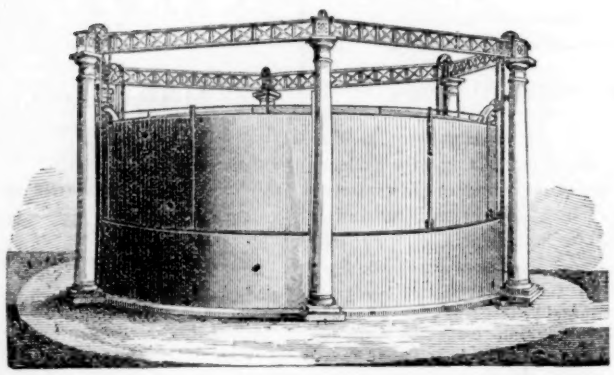

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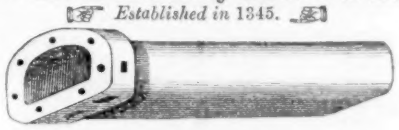

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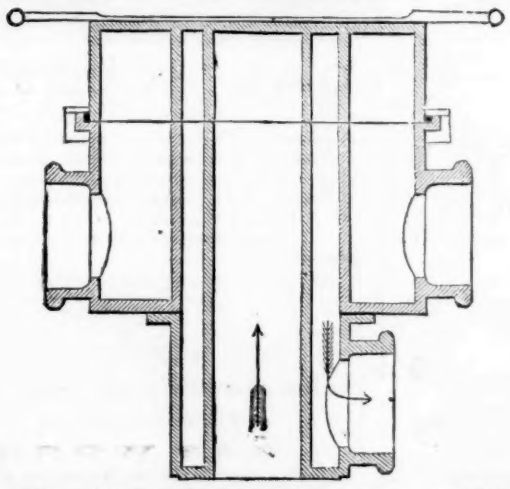

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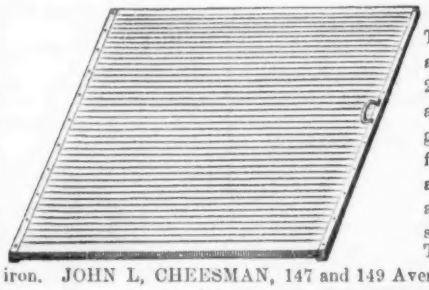

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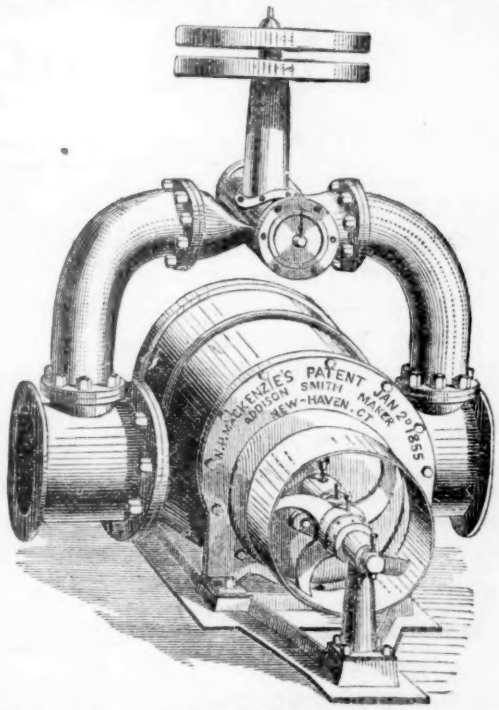

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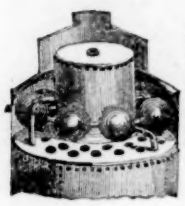

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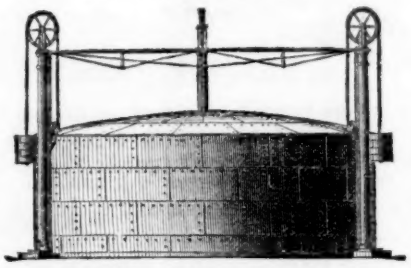

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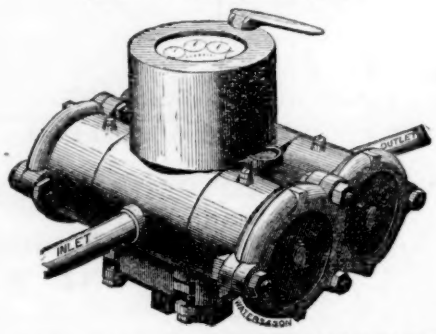

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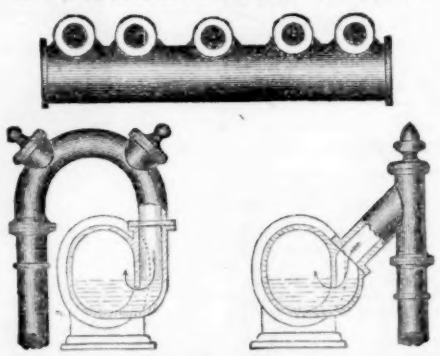

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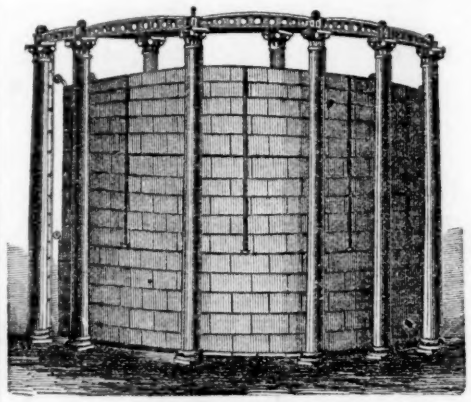

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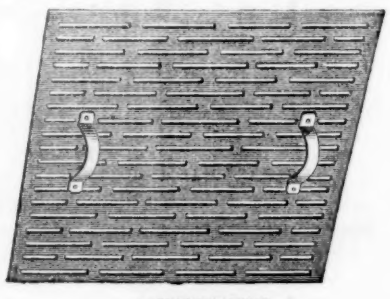

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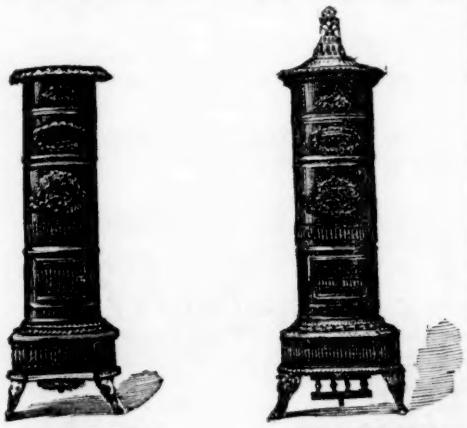

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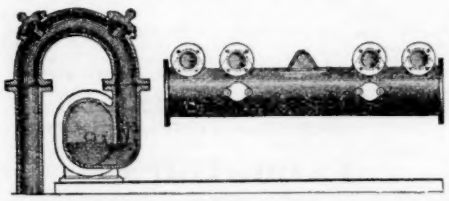

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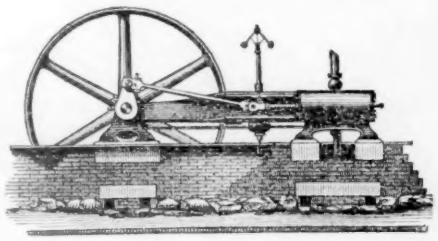

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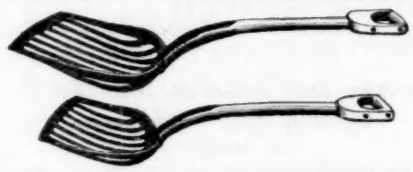

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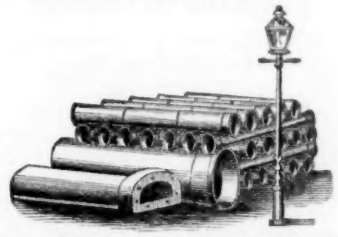

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San Salvador, .. " 13
San Jacinto, .. " 20
San Salvador, .. " 27
San Jacinto Saturday, Nov. 3
San Salvador .. " 10
San Jacinto .. " 17
San Salvador, .. " 24

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214-3m

The South Bend Gas Works.

The St. Joseph Valley *Register* of Dec. 17th contains a detailed description of the gas works just completed at that place, from which we condense the following: The works were built by the well known firm of Murray, Baker & Walker, and cost $50,000. They are constructed with all the latest improvements, and are capable of making and delivering 40,000 cubic feet of gas per 24 hours. The retort house is built of brick, and covers a ground surface of 31x50 feet. The walls are seventeen feet in height, surmounted by a wrought-iron truss roof, and covered with the best quality of slate. It contains two benches of three retorts each, from the manufactory of E. D. White & Co. (late J. K. Brick & Co.) of Brooklyn, which are nine feet long, four of them 15x23, two 15x26. The stand-pipe and hydraulic main are the same size as those in the new works in Chicago. The condensing house is 21x19 feet, of the same height as the retort house, and covered with the same kind of material. Walker's combined washer and condenser, the invention of James H. Walker, of Fort Wayne, Ind., has been introduced. The purifying boxes are of iron, 5x5 feet, with five tiers of lime trays, and are connected by a six-inch dry centre valve. The station meter, as well as those used by the consumers, are from the meter manufactory of Harris & Bro., of Philadelphia. The station meter is capable of registering 60,000 cub. ft. per 24 hours. The gasholder is built of the best American No. 14 iron, with a capacity of 30,000 cubic feet, being 52 feet in diameter, and about 15 feet depth of sides. It is guided by five very strong wrought-iron latticed tripods. The tank is a substantial structure of brick, and so carefully has it been constructed that, though built on a side hill and banked the full height for half its circumference, and had been filled with water but two weeks, it is water-tight. Messrs. Murray, Baker & Walker, of Fort Wayne, manufactured the whole of the apparatus, and the works were designed and erected under the immediate supervision of Mr Jame H. Walker, our valuable correspondent, "Out West." The works are now under the superintendence of John Walker, of South Bend. The *Register* states that the gas furnished by the Company is of the best quality, and gives great satisfaction to the consumers. In another column our readers will find an interesting communication from "Out West," in which is given an account of an accident which befel the works lately.

Advertising Index.

☞ In looking for advertisements, see figures 1 to 9, within brackets, at head of advertisement pages.

GAS-BURNERS, APPARATUS ETC.

Arnold's Metallic Gas Trays—T. G. Arnold, 334 and 336 West 21st street, N. Y. 6
American Meter Company, 512 West 22d street, New York. 8
Automatic Gas Purifier—State Rights for sale—Wm. C. Turnbull, care of T. C. Babcock, 59 Broadway, or office of the American Gas-Light Journal. 2
Builder of Gas Works, Apparatus, Etc.—P. P. Deily, 39 Laurel street, Philadelphia. 6
Begg's Lamp Regulator—Office Gas-Light Journal, 22 Pine st. .
Cambridge Gas Stoves, Ranges, &c.—Gas Light Journal Offices,
Contractors for Gas-Works, Etc.—Murray, Baker & Walker, Fort Wayne, Ind. .
Gas Fixtures, Etc.—Archer & Pancoast Manufacturing Co., 9, 11 and 13 Mercer street, New York. 3
Gas Fitters' and Plumbers' Materials—McNab & Harlin, 86 John street, New York. 2
Gas Coals—Bird, Perkins & Job, 104 Wall street, New York. 4
Gas Engineers and Contractors—Hoy, Kennedy & Co., 111 Liberty street, New York. 4
Gas-Burners—C. Gefrorer, 529 Commerce street, Philadelphia, Pa. 9
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry street, Philadelphia, Pa. 8
Gas Superintendent—C. M. Cresson, 417 Walnut st., Phil., Pa. 9
Gas Apparatus, &c.—Geo. H. Kitchen & Co., 561 Broadway. 9
Gas Burners—Wightman Bros., 25 Kilby st., Boston, Mass. 9
Gas Burners—T. G. Arnold, 224 and 226 West 21st st., N. Y. 9
Gas Burners—W. Anderson, cor Franklin & Elm sts., N. Y. 8
Gas Works for Sale—Colonel J. A. Sabbaton, Manhattan Gas Works, N. Y. 9
Gas Stoves—A. L. Bogart, 792 Broadway. 7
Gas Fixtures, Meters, Etc., Etc.—McHenry & Carson, Cincinnati, Ohio. 4
Gas Fixtures & Chandeliers—Alfred Bliss & Co., 95 Bleecker-st., New York. 4
Gasometers, Etc—George Stacey & Co. Cincinnati, O. 6
Gas-works of London—D. Van Nostraud, 192 Broadway. 3
Gas and Kerosene Fixtures, &c.—Tocker Mfg Co, 128 William street, New York; 117 and 119 Court street, Boston, Mass. 2
Gas Works for sale—Superintendent, Tiffin, Ohio. 1
Gas Fixtures, Etc.—Mitchell, Vance & Co., 597 Broadway. 3
Jersey City Gas Meter Works. 14 Morris st., Jersey, N. J. 3
Patent Gas Exhauster—Smith & Sayre, 484 Broadway. 5
Purifying Trays—Jno. L Cheeseman, 147 and 149 Ave. C, N.Y. 2
Portable Gas Works—Covell & Co., 554 Broadway, New York. 3
Robbins' Patent Joint for Gas and Water Pipes. 4
Stanley's Hydraulic Main, Etc.—L. F. Whiting, Boston. 6

FOUNDRIES.

Brooklyn Tube Works—B T Benton, Brooklyn. 9
Columbian Iron Works—Wm. Taylor & Sons, 11, 13 and 15 Adams street, Brooklyn, N. Y. 7
Cast Iron Pipes and Fittings—B. S. Benson, 52 East Monument street, Baltimore, Md. 1
Continental Works—T. F. Rowland, Greenpoint. 6
Erie Basin Iron Works—Elizabeth, Dwight and Van Dyke sts., South Brooklyn, N. Y. 6, 7
Keystone Iron Works. 3
Louisville Pipe Works—Dennis Long, Cor. 9th and Water-sts., Louisville, Ky. 9

Manufacturing Enamelers—Nessle & Taylor, 97 Water street, Brooklyn, N. Y. 7
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman and Wilkins streets, Pittsburgh, Pa. 4
Oregon Iron Foundry—Herring & Floyd, 738, 740, 742 and 744 Greenwich street, New York. 8
Pascal Iron Works—Morris, Taskar & Co., Philadelphia, Pa. 9
Southwark Foundry—Merrick & Sons, Fifth and Washington streets, Philadelphia. 9
Wrought Iron Pipes, etc.—Joseph Nason & Co., 61 Beekman street, New York. 4

WATER METERS, PUMPS, ETC.

Ashcroft's Low-water Detector, 50 John street, New York. 6
Aubin Water Meter—H. Q. Hawley, Albany, N. Y. 7, 9
Babcock & Wilcox's Stationary Steam Engines. 8
Davis' Steam Superheating Boiler—Duplex Steam Boiler Mf'g Company, Long Island City, N. Y. 9
Pat. Lead-Encased Tin Pipes—Colwells, Shaw & Willard, foot of West 27th street, N. Y. 4
Patent Dry Centre Valve—American Meter Company, 512 West 22d street New York. 5
Steam Pumps—H. R. Worthington, 61 Beekman st. New York. 7
Water Pipes, etc.—S. Fulton & Co. 207 North Water st Phila. 9
Water Closets, etc.—Wm. S. Carr & Co. 149, 151, 153, 155, 157 Centre street, New York. 4
Water and Sewerage Pipes—Am. Water and Gas Pipe Company northwest corner of Green and Bay sts., Jersey City, N. J. 5
Worthington's Water Meters—H. R. Worthington, 61 Beekman street, New York. 6

CLAY RETORT WORKS.

B. Kreisher, Clay Retorts, Etc., 58 Goerck street, New York. 5
Bay State Clay Retort Works, 125, 127 Water st. Boston, Mass. 6
Brooklyn Clay Retort Works, Van Dyke st. Brooklyn, N. Y. 5
Jersey City Fire Brick Works.—J. H. Gautier & Co., Greene, Essex and Bergen streets, Morris Canal Basin, N. J. 5
Laclede Fire Brick Works, 1007 North Levee, St. Louis, Mo. 8
Manhattan Clay Retort Works, 15th st. near Av. C, New York. 5
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MINING MACHINERY, ETC.

Broker in Mining Stocks—C. H. Smith 145 B'way, New York. 4
Industrial Chemistry—Prof. H. Dussauce, New Lebanon, N. Y. 2
Mining Engineer—J. H. Tiemann, 240 Pearl st. New York. 4
Sodium Amalgam &c.—Prof. Wurtz, 26 Pine st., New York. 6
School of Mines, Columbia College, East 49th st. " 2
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LAMPS, STOVES, PETROLEUM, ETC.

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Street Lamps—J. G. Miner, Morrisania, Westchester Co., N.Y. 2
Lamps, &c.,—Julius Ives & Co., 49 Maiden Lane, N. Y. 9

MISCELLANEOUS.

A Rare Opportunity for Investment—Offices of this Journal. 8
Apparatus For Sale—Washington (D. C.) Gas Company. 6
Bird Cages—Osborn Manufacturing Company, 109 Bleecker st. 8
Cameron Coal Company—42 Broadway. 1
Despard Coal. 1
Empire S. S. Line for Savannah, Garrison & Allen, 5 Bowling Green. 9
Empire Sewing Machine Company, 294 Bowery. 6
Finkle & Lyon Sewing Machine Company, 581 Broadway. 9
Fodell's "Book-keeping for Gas Companies". 2
Gas-Light Journal American and Foreign Patent Agency. 8
Opposition S. S. Line to California—177 West st., cor. Warren. 9
Professor Henry Wurtz—Office Gas-Light Journal. 3
Prince's Metallic Paint—D. Sloan & Co. 115 Liberty street. 5
Plastic Slate Roofing Co. 157 Broadway. 8
Pianos—Raven & Bacon, 644 and 646 Broadway, N. Y. 9
Partner Wanted—Wm. Bent, Medina, Orange County, N. Y. 8
Platinum—Vessels, Apparatus, Sheet-wire, etc.—H. M. Raynor, 748 Broadway, N. Y. 3
Roofing Materials—E. Van Orden & Co. 41 Liberty st. 4
Rubber Goods—O. B. Gray, 201 Broadway. 4
Smedberg's "Synopsis of Gas-Lighting". 2
Situation Wanted as Manager of a Gas Work. 3
Steam Cooking Apparatus—Bennett, Johnson & Co., 42 Dey st., New York. 6
Sabbaton's Patent Screening Shovels—A. T. Smithe, No. 126 Maiden Lane, New York city. 8
Smith & Sayre Manufacturing Company, 95 Liberty street. 5
Situation as Superintendent Wanted—Sup't Office G. L. Jour. 2
Situation Wanted by an Engineer of many years, Experience. 6
Treatise on the Manufacture of Gas—D. Van Nostrand, 192 Broadway, New York. 8
Ventilation—Henry A. Gouge, 254 Broadway. 6
Watches—T. B. Bynner 189 Broadway. 2
Works on the Manufacture of Gas—D. Van Nostrand, 192 Broadway, New York. 2

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☞ All communications to be addressed to "The Editors," No 22 Pine Street, New York.